A Review on Generative Adversarial Networks: Algorithms, Theory, and Applications

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Abstract

Generative adversarial networks (GANs) have recently become a hot research topic; however, they have been studied since 2014, and a large number of algorithms have been proposed. Nevertheless, few comprehensive studies explain the connections among different GAN variants and how they have evolved. In this paper, we attempt to provide a review of the various GAN methods from the perspectives of algorithms, theory, and applications. First, the motivations, mathematical representations, and structures of most GAN algorithms are introduced in detail, and we compare their commonalities and differences. Second, theoretical issues related to GANs are investigated. Finally, typical applications of GANs in image processing and computer vision, natural language processing, music, speech and audio, the medical field, and data science are discussed.